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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,220	07/12/2004	Daniel Cuzin	HIRSCH-0028	3826

23599 7590 04/21/2006

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EXAMINER	
COOLEY, CHARLES E	
ART UNIT	**PAPER NUMBER**
1723	

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/501,220	CUZIN ET AL.	
	Examiner	Art Unit	
	Charles E. Cooley	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 July 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *07122004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

NON-FINAL OFFICE ACTION

1. This application has been assigned to Technology Center 1700, Art Unit 1723 and the following will apply for this application:

Please direct all written correspondence with the correct application serial number for this application to Art Unit 1723.

Telephone inquiries regarding this application should be directed to the Electronic Business Center (EBC) at http://www.uspto.gov/ebc/index.html or 1-866-217-9197 or to the Examiner at (571) 272-1139. All official facsimiles should be transmitted to the centralized fax receiving number 571-273-8300.

Priority

2. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d). All of the CERTIFIED copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

Information Disclosure Statement

3. Note the attached PTO-1449 form submitted with the Information Disclosure Statement filed 12 JUL 2004. The crossed through foreign references are cited on the attached PTO-892 form (for scanning purposes as these references are currently missing from the IFW file).

Oath/Declaration

4. The oath or declaration is defective. A new oath or declaration in compliance with 37 C.F.R. § 1.67(a) identifying this application by its Serial Number and filing date is required. See M.P.E.P. §§ 602.01 and 602.02.

The oath or declaration is defective because:

a. it is not directed to the instant U.S. Application.

b. it is not in the English language.

Drawings

5. The drawings are objected to under 37 CFR § 1.83(a) since the drawings must show every feature of the invention specified in the claims. Therefore, the following features must be shown or the features canceled from the claims. No new matter should be entered.

a. the subject matter of claim 7.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "3", "4" and "7". Correction is required. Applicant should ensure all reference characters in the drawings are described in the detailed description portion of the specification.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

Replacement Drawing Sheets

Drawing changes must be made by presenting replacement figures which incorporate the desired changes and which comply with 37 CFR 1.84. An explanation of the changes made must be presented either in the drawing amendments, or remarks, section of the amendment. Any replacement drawing sheet must be identified in the top margin as "Replacement Sheet" (37 CFR 1.121(d)) and include all of the figures appearing on the immediate prior version of the sheet, even though only one figure may be amended. The figure or figure number of the amended drawing(s) must not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin.

Annotated Drawing Sheets

A marked-up copy of any amended drawing figure, including annotations indicating the changes made, may be submitted or required by the examiner. The annotated drawing sheets must be clearly labeled as "Annotated Marked-up Drawings" and accompany the replacement sheets.

Timing of Corrections

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.85(a). Failure to take corrective action within the set period will result in ABANDONMENT of the application.

If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings MUST be filed within the THREE MONTH shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

Specification

7. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

8. The disclosure is objected to because of the following informalities:

a. The specification should have the following headings inserted therein at the appropriate locations in accordance with 37 CFR 1.77:

Arrangement of the Specification

The following order or arrangement is preferred in framing the specification and, except for the title of the invention, each of the lettered items should be preceded by the headings indicated below.

(a) Title of the Invention.
(b) Cross-References to Related Applications (if any).
(c) Statement as to rights to inventions made under Federally-sponsored research and development (if any).
(d) Background of the invention.
    1. Field of the Invention.
    2. Description of the Related Art including information disclosed under 37 C.F.R. §§ 1.97-1.99.
(e) Summary of the Invention.
(f) Brief Description of the Drawing.
(g) Description of the Preferred Embodiment(s).
(h) Claim(s).
(I) Abstract of the Disclosure.

Appropriate correction is required.

9. The use of the trademarks on page 1 of the specification have been noted in this application. They should be capitalized wherever it appears and be accompanied by the generic terminology. The specification thus requires correction.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

10. This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required. The PCT abstract is not a proper abstract for IFW purposes.

11. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed (MPEP 606.01). The examiner objects to the "SHAKING" terminology since the instant invention is not a shaking device within the conventional meaning of the agitation art. Note the claims recite a stirring device.

Claim Rejections - 35 U.S.C. § 112, second paragraph

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claims 4-6 and 13-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The second paragraph of 35 U.S.C. § 112 requires a claim to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Under *In re Hammack*, 427 F.2d 1378, 166 USPQ 204 (CCPA 1970) and In re Moore,

169 USPQ 236 (CCPA 1971), claims must be analyzed to determine their metes and bounds so that it is clear from the claim language what subject matter the claims encompass. This analysis must be performed in light of the applicable prior art and the disclosure. The definiteness of the claims is important to allow others who wish to enter the market place to ascertain the boundaries of protection that are provided by the claims. *Ex parte Kristensen*, 10 USPQ 2d 1701, 1703 (BPAI 1989).

One of the purposes of 35 U.S.C. § 112, second paragraph, "is to provide those who would endeavor, in future enterprise, to approach the area circumscribed by the claims of a patent, with adequate notice demanded by due process of law, so that they may more readily and accurately determine the boundaries of protection involved and evaluate the possibility of infringement and dominance." *In re Hammack*, supra. As set forth in *Amgen Inc. v. Chugai Pharmaceutical Co., Ltd.*, 927 F.2d 1200, 1217, 18 USPQ2d 1016, 1030 (Fed. Cir. 1991).

> The statute requires that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." A decision as to whether a claim is invalid under this provision requires a determination whether those skilled in the art would understand what is claimed. See *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 624, 225 USPQ 634, 641 (Fed. Cir. 1985) (claims must "reasonably apprise those skilled in the art" as to their scope and be "as precise as the subject matter permits.").

14. The pending claims fail to particularly point out and distinctly claim the subject matter which applicant regards as the invention and are therefore of indeterminate scope for the following reasons:

Claims 4-6, as amended, each have improper dependencies creating terms that lack antecedent basis.

Claim 13: "the upper part" and "the lower part" lack antecedent basis.

Claim 14, as amended: do the recited elements have any relationship to the elements recited in claim 12?

Claim 15: "the interface" lacks antecedent basis and the claim lacks any description of what constitutes "the interface" and is further devoid of any structure or step(s) to contain or position the substances such that the claimed interface can be formed. The claim is wholly vague and indefinite.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. Claims 1, 2, 3, 5, 6, 8, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by DE 19823839 A1.

DE 19823839 A1 discloses in the Figures, especially Fig. 3, a rotating member 4 on a hollow shaft 12, 15; the member 4 containing a packing UF in fluid communication with the hollow shaft and an area exterior to the member 4; discs 3, 6 fixed together as seen in the Figures; the packing UF disposed in a space between the discs 3, 6; the

hollow shaft having an upper part 12 and/or 27 integral with the disc 3 and a lower part 15 integral with disc 6; the hollow shaft having openings (at an end below 16, 17 and at 25, 26 and/or 28); the opening 26 being at an end region of shaft 12; the opening 28 being at an end region of shaft 15; the shaft 15 having an opening below 16, 17 in Fig. 3); the openings 25, 26, 28 being in the side of the shaft; the packing UF being formed of ceramic, metal or plastic per the abstract. Claim 11 is but an intended use of the device not germane to the patentability of the device and the examiner considers the device of DE '839 most capable of forming dispersions and/or emulsions. Note the Figures below:

Nummer: DE 198 23 839 A1
Int. Cl.[6]: B 01 F 3/00
Offenlegungstag: 9. Dezember 1999

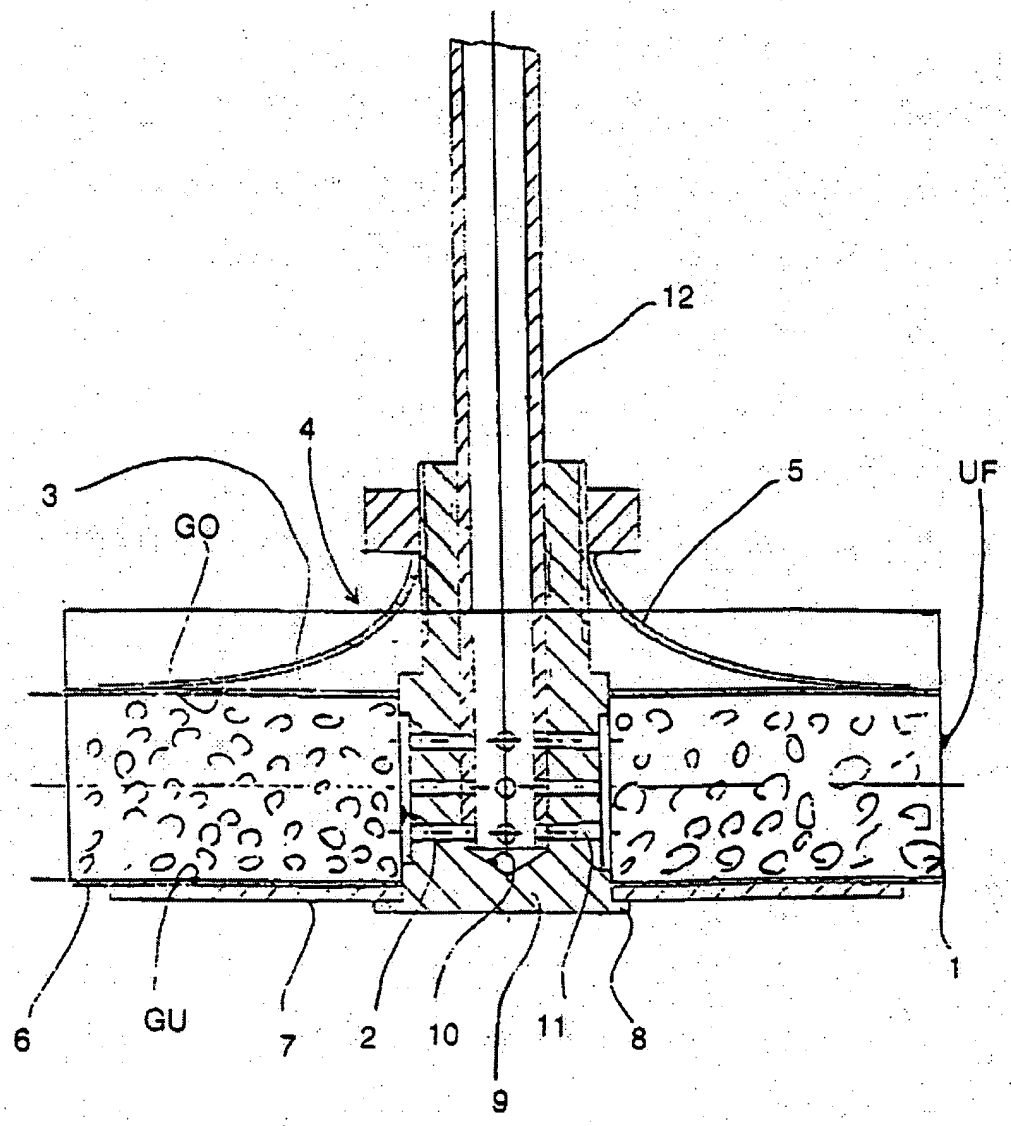

Fig. 1

Nummer: DE 198 23 639 A1
Int. Cl.[6]: B 01 F 3/00
Offenlegungstag: 9. Dezember 1999

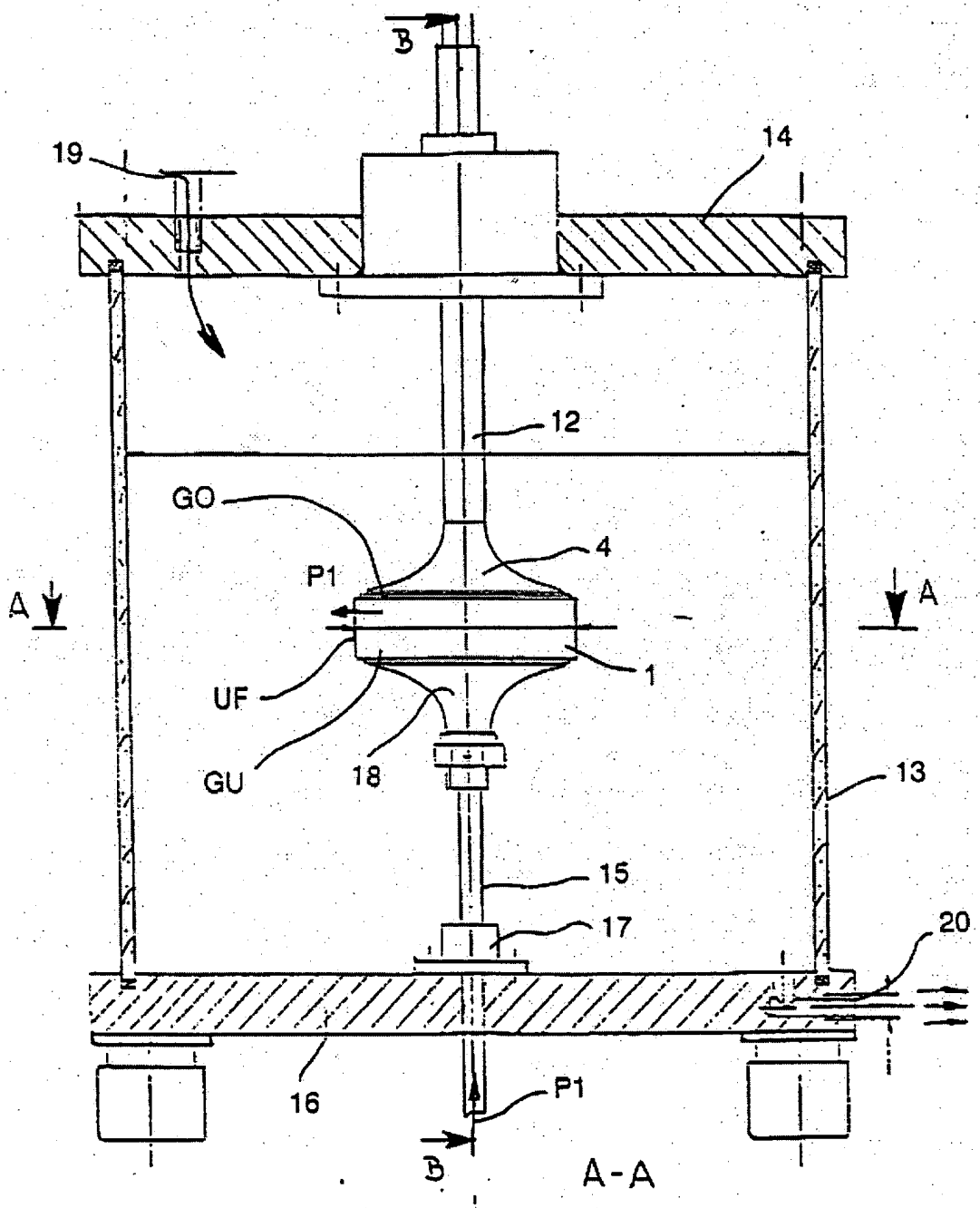

Fig. 2

Nummer: DE 198 23 839 A1
Int. Cl.[6]: B 01 F 3/00
Offenlegungstag: 9. Dezember 1999

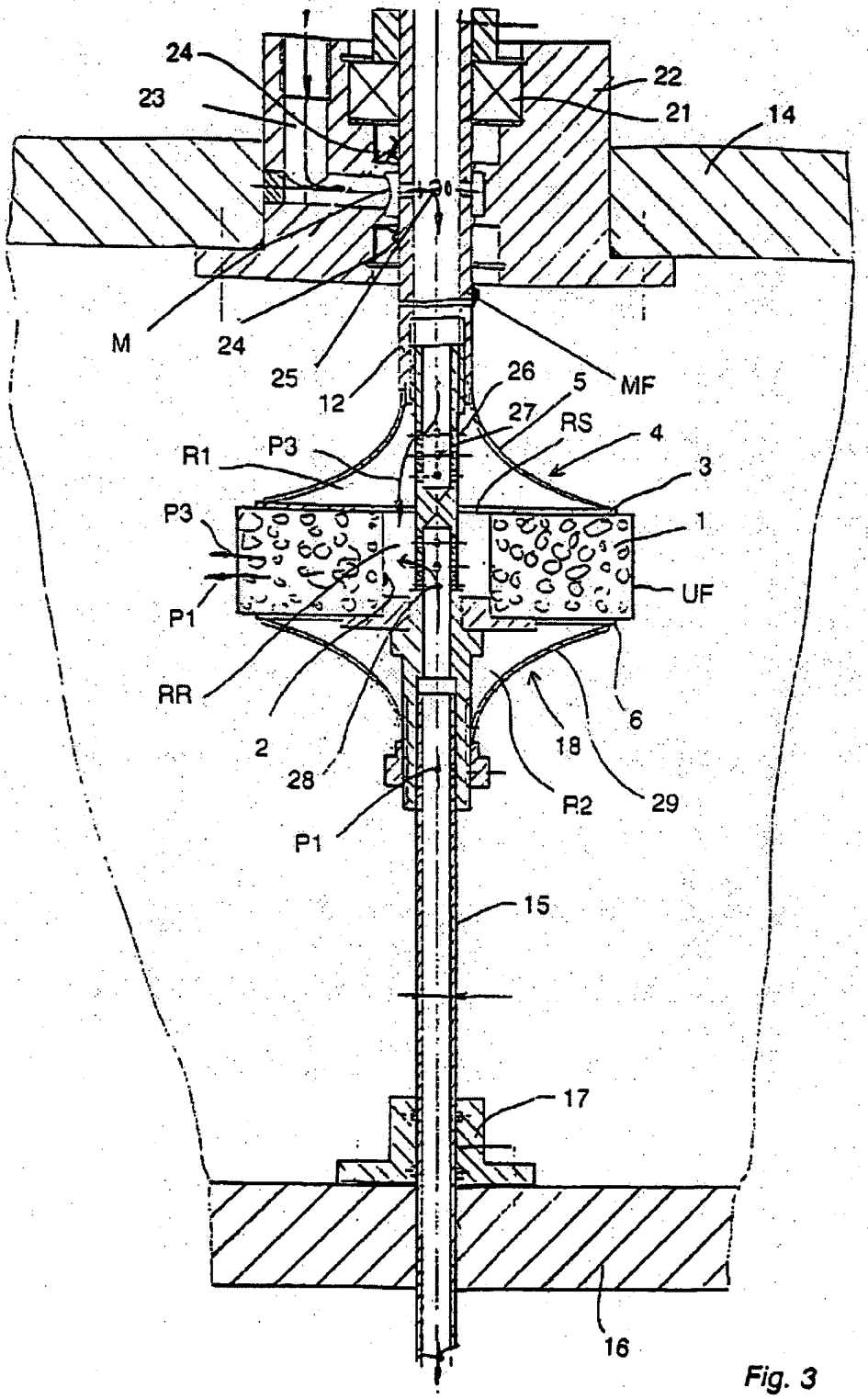

Fig. 3

17. Claims 1, 7, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by EP 0047921 A1.

EP 0047921 A1 discloses in the Figures, especially Figs. 1-2, a rotating member 11 on a hollow shaft 10, 21; the member 11 containing a packing (e.g., one of 17) in fluid communication with the hollow shaft and an area exterior to the member 11; pipes (one or more of 15) fixed radially on the shaft communicating with the hollow space of the shaft and having a respective packing 17. Claim 11 is but an intended use of the device not germane to the patentability of the device and the examiner considers the device of EP '921 most capable of forming dispersions and/or emulsions. Note the Figures below:

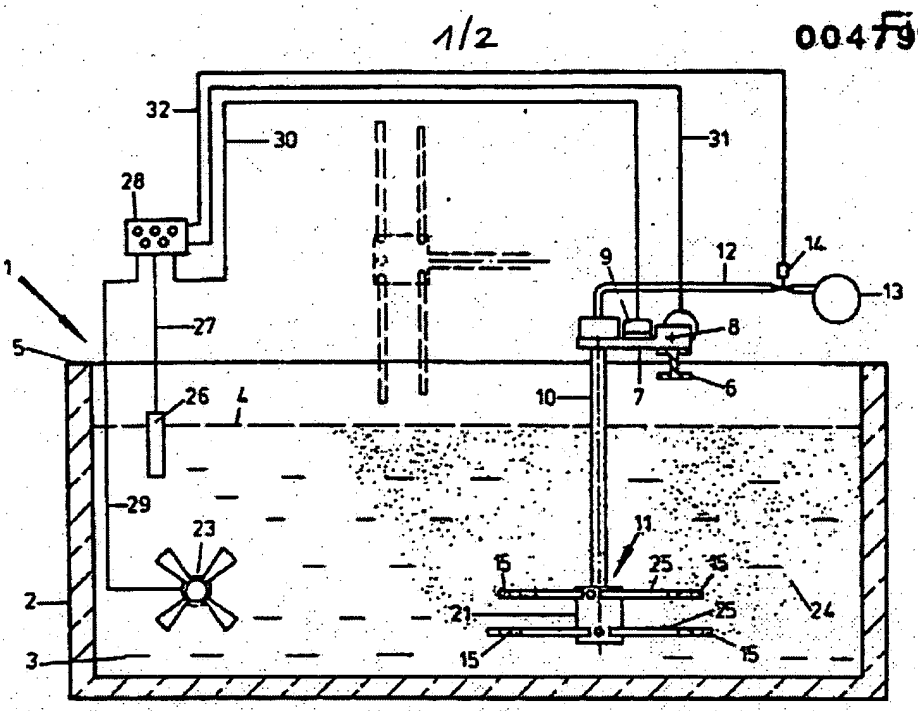
1/2
004791
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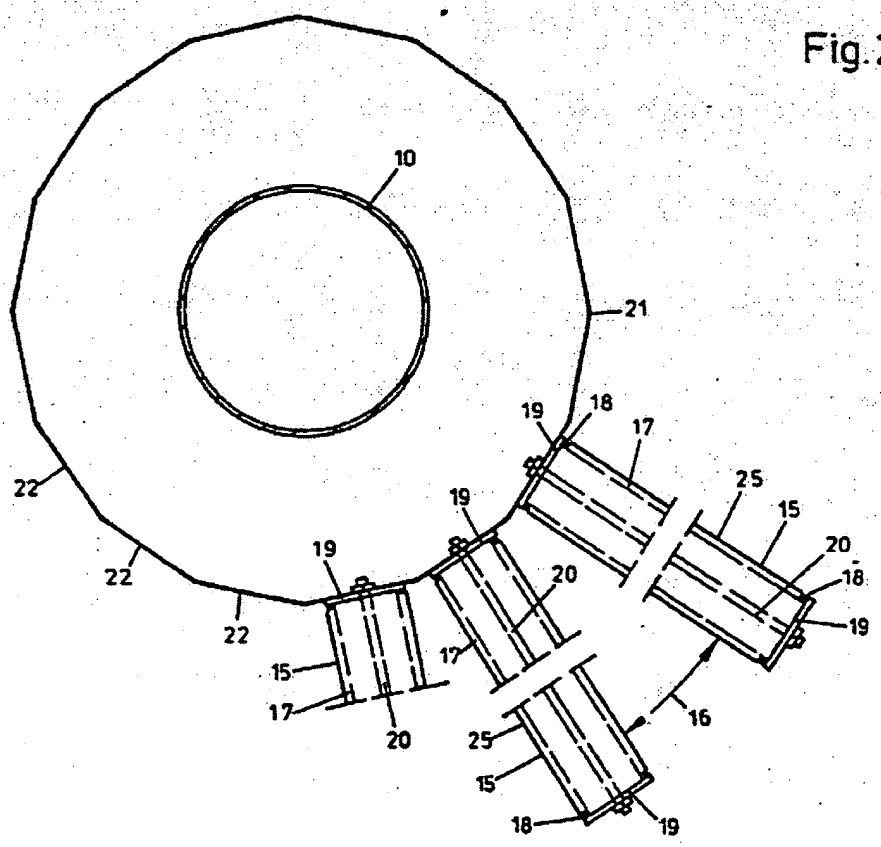
Fig. 2


10
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22
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18
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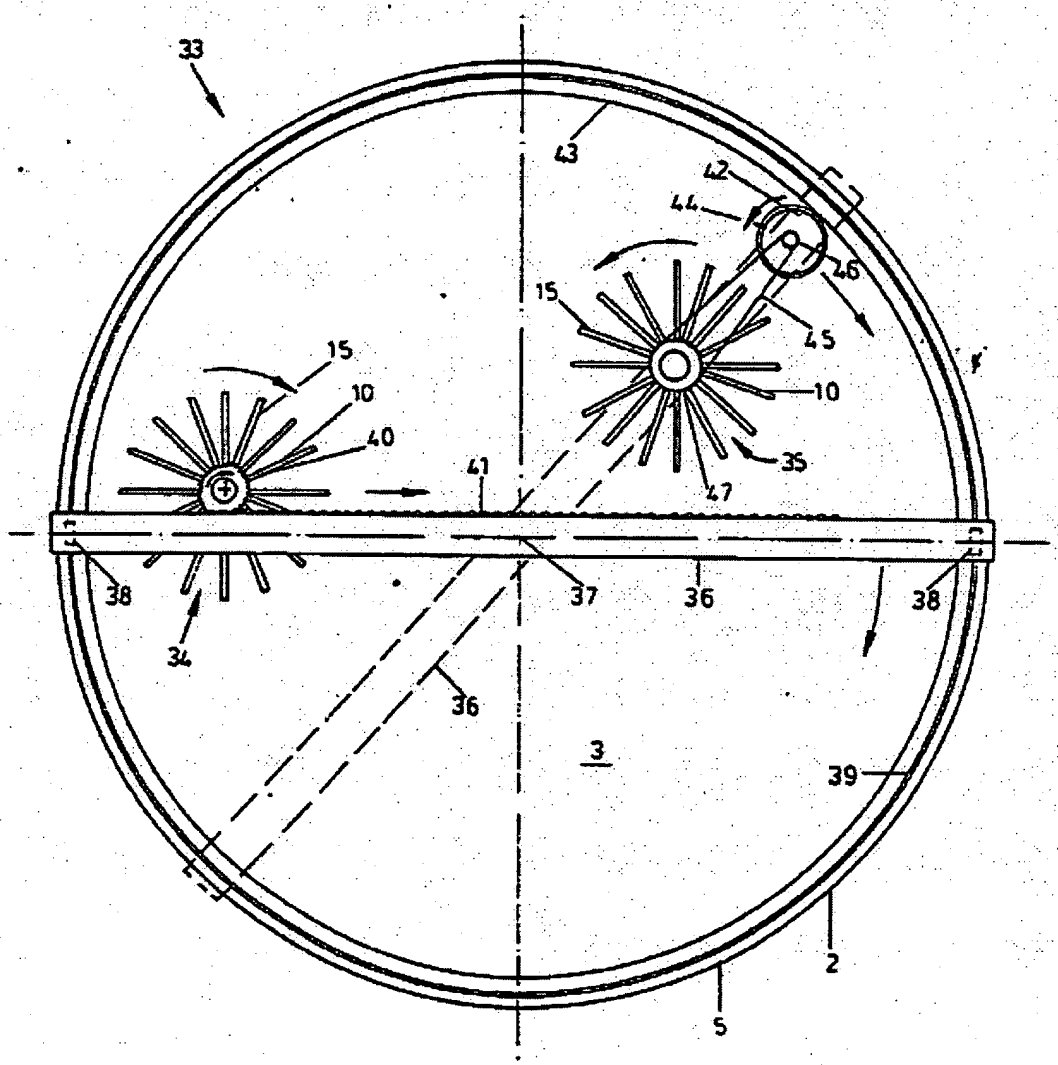
16

0047921

2/2

Fig.3



18. Claims 1, 4, 5, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Gunther (US 2,448,590).

Gunther discloses in the Figures, especially Fig. 2, a rotating member 14 on a hollow shaft 12; the member 14 containing a packing B in fluid communication with the hollow shaft and an area exterior to the member 14; discs 31, 40 fixed together as seen in Figure 2 by spacers 35, 41; the shaft 12 being open at both ends (Col. 2, lines 18-20). Claim 11 is but an intended use of the device not germane to the patentability of the device and the examiner considers the device of Gunther most capable of forming dispersions and/or emulsions. Note the Figures below:

Sept. 7, 1948. R. E. GUNTHER 2,448,590

APPARATUS FOR DISPERSING GASES IN LIQUIDS

Filed Oct. 18, 1946

Fig. 1

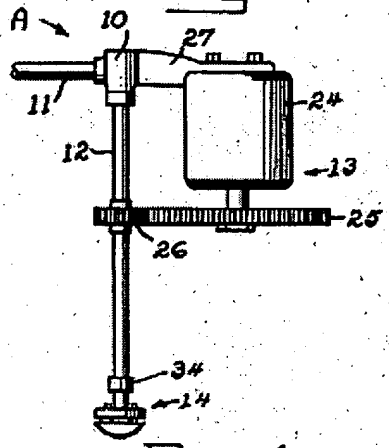


Fig. 2

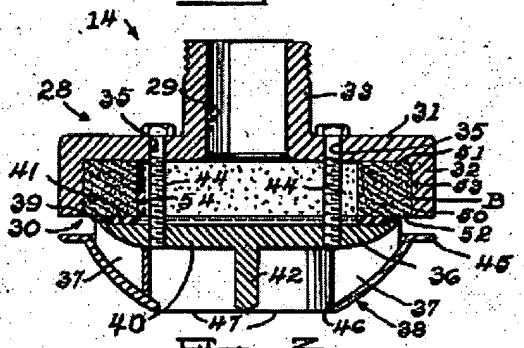


Fig. 3

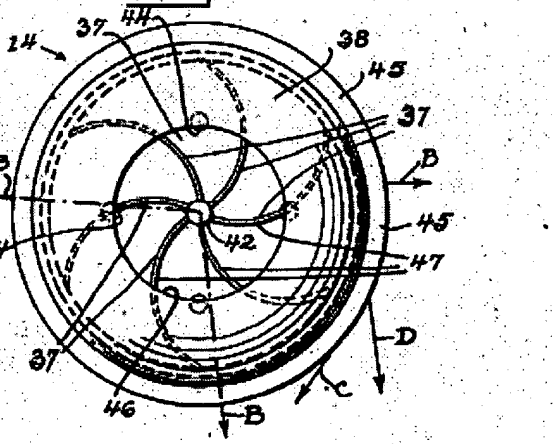


Fig. 4

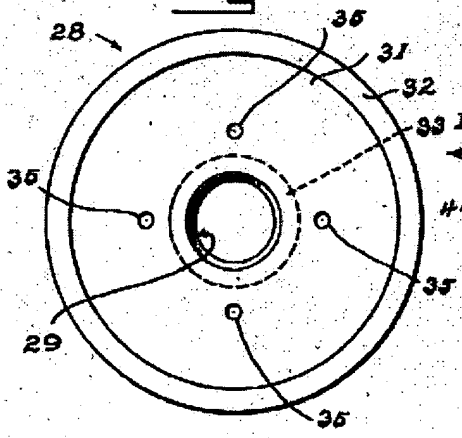


Fig. 5

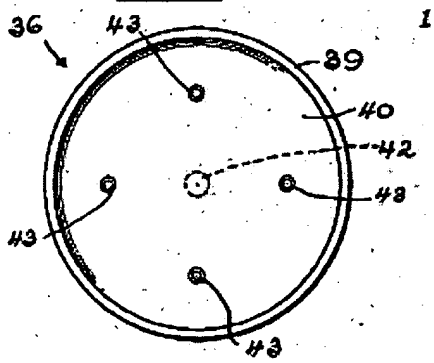
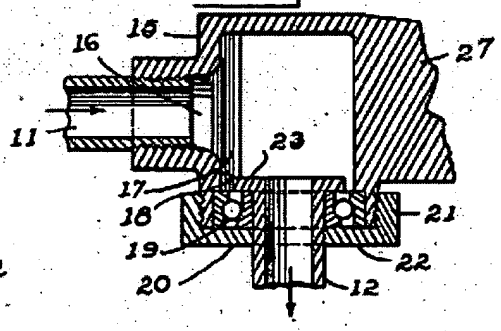


Fig. 6



19. Claims 1, 2, 3, 4, 5, 6, 8-12, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Ramshaw et al. (US 4,283,255).

Ramshaw et al. discloses a method and an apparatus in the Figures, especially Fig. 1, including a rotating member (Fig. 1) on a hollow shaft 4; the member containing a packing 9 and/or 12 in fluid communication with the hollow shaft and an area exterior to the member; discs 1, 3 fixed together as seen in Figure 1; the packing 9 and/or 12 disposed in a space between the discs 1, 3; the hollow shaft may have an upper part integral with the disc 3 (col. 3, lines 39-48) and a lower part 4 integral with disc 1; the hollow shaft having openings (at an end below 4 and the distal opening in the disc 1); the discs 1, 3 fixed together as seen in Figure 1 by spacer 2; the packing being formed of the recited materials (as underlined below). Claim 11 is but an intended use of the device not germane to the patentability of the device and the examiner considers the device of Ramshaw most capable of forming dispersions and/or emulsions. The method is disclosed via the underlined text below.

More specifically, the patent to Ramshaw et al. discloses a process and apparatus for effecting mass transfer between two phases, one of which is a liquid and to apparatus for use in such a process. By "mass transfer" it is meant to transfer to a first fluid phase, which is a liquid, from a second fluid phase which is immiscible with the first fluid phase, or vice versa, of at least a proportion of a substance which is a solute for the liquid. Absorption and distillation, process which are widely used in the chemical and petrochemical industries, are typical mass transfer processes. Where a mass transfer process involves transfer of a solute from a liquid to a gas, or vice versa, the

process may be "gas-film controlled", or "liquid-film controlled". In "gas-film controlled" mass transfer processes, e.g. the absorption of ammonia into water from an ammonia/air mixture, the rate of mass transfer is limited predominantly by diffusion of the solute through the gas phase. In "liquid-film controlled" mass transfer processes, e.g. the absorption of oxygen into water from air, the rate of mass transfer is limited predominantly by diffusion of the solute through the liquid phase. Where a mass transfer process involves transfer of a solute from a first liquid to a second liquid the process is "liquid-film controlled" and the rate of mass transfer is limited predominantly by diffusion of the solute through one of the liquids.

Accordingly, the present invention provides a process for effecting mass transfer between two fluid phases, the first of which is a liquid, which process comprises charging the said fluids to an element which has a large interfacial area and which is permeable to the fluids (hereinafter permeable element) rotating the permeable element about an axis such that the fluids flow through the pores of the permeable element and the first fluid flows radially outwards away from the said axis, and collecting at least a proportion of one of the fluids discharged from the permeable element characterized in that the speed of rotation of the permeable element is such that the fluids are subjected to a mean acceleration.

By "fluid" it is meant a substance or a mixture of substances, which is a gas or a liquid at the conditions of temperature and pressure at which the process of the invention is operated. For example, where the second fluid is a gas it may be one gas or a mixture of gases; the first fluid and/or the second fluid (where it is a liquid) may be a

neat liquid or may be a solution of one or more solutes in the liquid, which solute may be a gas, liquid or solid.

The permeable element may be an integral whole or a plurality of discrete components. Where the permeable element is an integral whole it may be formed with pores, e.g. cast as a block with pores; or have pores formed therein, e.g. cast as a solid block and pores drilled therein; to be arranged to form pores between the parts thereof, e.g. a coil wire. Where the permeable element comprises a plurality of discrete components, the individual components may be permeable, e.g. open-ended glass tubes, in which case a proportion of the pores are through the components and a proportion of the pores are between the components; preferably however, the individual components are non-permeable and particularly preferably they are non-permeable particles, e.g. glass or metal spheres, in which case the pores of the permeable element are between the components thereof. It is often preferred that the permeable element is an integral whole and is mechanically self-supporting. The permeable element may be formed from any material which has the mechanical strength to withstand the stress generated in the material during rotation of the permeable element at the rotational speeds employed. Preferably the material is resistant to attack by or reaction with the fluids with which it may be in physical contact. Typically, the material from which the permeable element is formed is a glass, a plastic, e.g. a silicone resin or polytetrafluoroethylene, or a chemically resistant metal, e.g. stainless steel, nickel, titanium or tantalum. Alternatively the material may be a composite of two or more materials in an appropriate disposition. For example, it may comprise a corrosion

resistant coating, e.g. of glass or plastic, on a corrodible support, e.g. corrodible metal spheres. While the permeable element is conveniently homogeneous, it may be a composite. For example, an annulus of glass beads may be surrounded by an annulus of wire mesh which may be surrounded by a random mat of polytetrafluorethylene fibers. It will be appreciated that where the permeable element is not mechanically self-supporting, e.g. it comprises an integral whole arranged to form pores between the parts thereof, or a plurality of discrete components, or is a composite, means to retain the permeable element in a desired shape and to maintain its permeability are often necessary. The said means is preferably in the form of a member which is rotatable about the same axis as the permeable element (hereinafter "rotatable member") and in which the permeable element is disposed. Moreover, where the permeable element is mechanically self-supporting it is often preferably disposed in a rotatable member.

While the permeable element may have straight pores, e.g. it may comprise aligned glass tubes or a metal block with channels drilled therein, preferably it has tortuous pores through which the fluid flows, e.g. sold under the trademark it may be a coil of woven type, a sintered mass, knitted or woven wire cloth, a crumpled mesh, skeleton foam, e.g. "Retimet", a random mat of fibers, or a mass of fibers or of particles. Where particles are employed they may all have the same size and shape, or the sizes and/or shapes may be random, or the size and/or shape may be ordered. Particles which may be employed include inter alia particles sold under the trademark, Intalox saddles, ceramic chips, wire gauze pieces, or glass beads. Preferably the particles, where they are employed, have a regular shape and a uniform size, particularly

preferably they are glass beads, more particularly preferably glass beads having a diameter within the range 0.5 mm to 2 mm.

The permeable element preferably has a plane of symmetry in which the axis of rotation lies, e.g. it may be in the form of a permeable rod which is rotated about an axis perpendicular to the axis of the rod and distant the mid-point thereof. Particularly preferably the permeable element has a plurality of planes of symmetry which intersect at a line co-incident with the axis of rotation, e g. it may be in the form of a permeable rod which is rotated about an axis perpendicular to the axis of the rod and co-incident with the mid-point thereof. More particularly preferably the permeable element has an axis of symmetry which coincides with the axis of rotation, e.g. the permeable element may be in the form of an annulus which is rotated about its axis of symmetry. Where the permeable element is in the form of an annulus the outer diameter of the annulus is typically in the range 25 cm to 5 meters, and the inner diameter is typically in the range 5 cm to 20 cm.

While the axis of rotation may be horizontal or vertical or at any angle between, it is often convenient to have the axis vertical. Where a permeable element in the form of an annulus is employed, typically rotary movement is applied to it by a shaft projecting from the plane of the annulus along the axis thereof, (e.g. from the top and/or bottom if the axis is vertical). The permeable element may be rotated by, for example, a variable speed fluid drive, a pulley which may be driven by a belt from an electric motor, or by turbo-propulsion.

Where a rotatable member is employed, the permeable element may be disposed throughout or in a proportion of the rotatable member. The size of the permeable element and its disposition in the rotatable member may be determined by the density and the interfacial area of the permeable element and by the flow characteristics of the fluids. Where the permeable element is disposed in a proportion of the rotatable member it is often preferred that the permeable element is disposed in a radially outer proportion of the rotatable member since as the distance from the axis increases the magnitude of the centrifugal forces which operate on the fluid to form a layer increases and hence the thickness of the layer is decreased. Where the permeable element is disposed in a rotatable member which has an axis of symmetry coincident with the axis of rotation, the permeable element is preferably distributed symmetrically around the axis so that the rotatable member is dynamically balanced when it is rotated.

The rotatable member, where it is employed, may be constructed of any material which has (a) the mechanical strength to withstand the stress generated in the material during rotation of the rotatable member at the rotational speeds employed and (b) and corrosion resistance to tolerate the environments with which the rotatable member may be in contact during use. Typical materials from which the rotatable member may be constructed include inter alia stainless steel, mild steel, brass, aluminum, nickel, Monel. Choice of a suitable material will present no problem to those skilled in the art.

In general, the speed of rotation will be in the range 50 rpm to 10,000 rpm, preferably in the range 100 rpm to 5,000 rpm and particularly preferably in the range

500 rpm to 2000 rpm. The speed at which the permeable element is rotated will depend inter alia on its porosity, the throughput of fluids required and the radial distance over which the fluids flow in the permeable element. The minimum speed at which the permeable element is rotated is often determined by the flow characteristics of the fluid. The maximum speed at which the permeable element may be rotated is governed by the mechanical strength of the permeable element, and where it is employed, by the mechanical strength of the rotatable member. Where a rotatable member is employed and where it is in the form of a hollow stainless steel disc in which the permeable element is disposed, typical rotation speeds are; for a disc of 0.5 meters diameter, 1000-3000 rpm; for a disc of 1 meter diameter, 500-2000 rpm; for a disc of 1.5 meters diameter, 400-1000 rpm. As the speed of rotation increases the thickness of the layer of liquid on the walls of the pores of the permeable element at a fixed distance from the axis of rotation decreases. The design of bearings for the rotatable member may be those well known in the engineering art, e.g. radial and thrust bearings of conventional design.

The direction of flow of the second fluid in the process according to the present invention will depend on the relative densities of the two fluids and on their flow rates. Co-current or counter current flow may be operated; increasing the speed of rotation of the permeable element often facilitates counter current flow; increasing the flow rate of the first fluid often facilitates co-current flow. Counter current flow is often preferred. Where counter current flow is employed it will be appreciated that means are necessary distant the axis of rotation and preferably adjacent the radially outer perimeter of the

permeable element to charge the permeable element with the second fluid. Preferably the permeable element is supported in a rotatable member to form a space between the radially outer perimeter of the permeable element and the inner surface of the rotatable member into which space the first fluid flows to form a liquid seal through which the second fluid may be charged to the permeable element. Where the second fluid is a mixture of components they may be delivered to the said space through the same or separate delivery means which are conveniently radially directed channels in the base of the rotatable element.

Where the permeable element is supported in a rotatable member, means to deliver the first fluid to the permeable element typically comprises an orifice in the rotatable member through which the fluid may flow. Where the rotatable member is a hollow disc the delivery means is conveniently axially disposed, although we do not exclude the possibility that it may be located intermediate the axis of rotation and the perimeter of the rotatable member distant the axis of rotation. Where the first fluid is a mixture of components, these may be delivered to the permeable element through the same or separate delivery means, e.g. they may be delivered through concentric tubes.

Where a permeable element supported in a rotatable member is employed in the process according to the invention, means to discharge the first fluid from the rotatable member typically comprises an orifice in the periphery of the rotatable member distant from the axis of rotation, through which orifice the fluid may issue as a spray. Where the rotatable member is a hollow disc in which an annular permeable element is disposed

the orifice is conveniently in the form of a circumferentially extending slit in the wall of the hollow disc and the slit is preferably continuous.

Conveniently, a stationary fluid-collecting means is provided, e.g. a housing, surrounds the permeable element, or, where a rotatable member is employed, surrounds the rotatable member, in which fluid collecting means the fluids or components or derivatives thereof which are discharged from the permeable element may be collected. It will be appreciated that where counter current flow is occurring the permeable element and the rotatable member where it is employed, will be mounted in the fluid collecting means such that the fluids discharged from the porous element do not mix. Alternatively the permeable element or the rotatable member where it is employed, is provided with a circumferentially extending channel into which the first fluid flows. One or more suitably disposed stationary collecting means, e.g. a fan-tail scoop, dip into the channel and the rotational speed of the first fluid forces it through the collecting means to a suitable location.

The residence time of the fluids within the permeable element is a function of the radial dimensions of the permeable element, the nature and permeability of the permeable element, the rotational speed, and the flow rate of the fluids. These parameters interact with each other and affect the residence time. For example, where the radius is increased and the other parameters kept constant the residence time is increased; where the flow rate is increased and the other parameters kept constant the residence time is reduced; where the rotational speed is increased and the other parameters kept constant the residence time is reduced.

It will be appreciated that for the generation of a liquid surface of large area, the first fluid and/or the second fluid where it is a liquid preferably "wets" substantially the whole of the surface of the pores of the permeable element. Wetting of the permeable element will depend to a degree on dynamic factors but will be assisted if it is favored by equilibrium wetting conditions. Thus a fluid having a small interfacial tension with the permeable element will tend to displace from the surface of the pores of the permeable element a fluid having a large interfacial tension with the permeable element, which displacement process is assisted by a small interfacial tension between the two fluids. To improve the "wetting" of the permeable element the surface of the pores of the permeable element are preferably coated with a wetting agent, or a wetting agent is preferably added to at least one of the fluids. For example, where the first fluid is water and the pores of the permeable element have a hydrophobic surface, e.g. the permeable element is a mat of polytetrafluoroethylene fibers, suitable surfactants, e.g. sodium dodecylsulphate or a Monflur surfactant, may be added to the water.

A plurality of permeable elements, each provided with suitable fluid-collecting means, typically a housing, although we do not exclude the possibility that a circumferential channel and associated removal means as hereinbefore described may be employed, may be joined in series. It will be appreciated that suitable pumps where appropriate may be provided in the lines interconnecting adjacent permeable elements. Conveniently the permeable elements are mounted about a common axis. While the fluids may flow co-currently through the series, it is often preferred that counter-current flow operates.

Accordingly the invention further provides apparatus in which mass transfer between two fluid phases may be effected comprising a plurality of permeable elements connected in series and rotatable about a common axis, means to charge the fluids to the series of permeable elements and means to discharge the fluids from the series of permeable elements. Preferably each of the permeable elements is an annulus and more preferably the axis of each annulus is co-incident with the axis of rotation.

The materials and the structure of the permeable element and, where it is employed, of the rotatable member may be chosen with regard to the nature of the mass transfer occurring thereon. For example, where an endothermic reaction occurs in the process according to the present invention the permeable element and/or the rotatable member, where it is employed, may be provided with heating means, e.g. electrical resistance wires; where an exothermic reaction occurs in a process according to the present invention, the permeable element and/or the rotatable member, where it is employed, may be provided with cooling means, e.g. a cooling coil; where a process according to the present invention involves distillation, the permeable element and/or the rotatable member, where it is employed, may be provided with insulating means, e.g. a layer of glass fiber.

The process according to the present invention may be employed in inter alia, absorption, desorption, counter current extraction, distillation, homogenization processes.

In FIGS. 1 and 2 a hollow disc having a stainless steel base 1 and wall 2 and a transparent plastic lid 3 sold under the trademark Perspex bolted to the wall 2 is

provided with a hollow shaft 4. The hollow shaft 4 communicates with four radial channels 5 in the base 1 which lead to ports 6 through which a fluid may flow. The wall 2 is provided with a lip 7 which engages with an annular groove 8 in the lid 3. A mass of glass beads, 1 mm in diameter, supported in the hollow disc between the base and the lid by a radially inwardly disposed wire mesh 11 and a radially outwardly disposed wire mesh 12 form an annular permeable element. Two concentric tubes 13 and 14 project through the lid 3 via a gas-tight seal 15. The outer tube 13 communicates with four fan sprays 16 through which a fluid may be fed to the glass beads 9. The hollow shaft 4 is rotatably mounted on roller bearings in a bearing housing 17 which is attached to a stationary housing of stainless steel 18 provided with a port 19. An electric motor (not shown) provides the drive to the hollow shaft in a "vee" belt drive.

In operation, the hollow disc is rotated, a liquid is fed via the tube 13 to the glass beads 9, moves radially outward to fill the space between the wire mesh 12 and the wall 2 and is expelled through the passage defined by the lip 7 and the groove 8. A gas is fed into the apparatus through the hollow shaft 4 and the channels 6 and enters the annular space between the wall 2 and the wire mesh 12. The liquid in the space between the wall 2 and the outer mesh 11 prevents escape of gas at the wall 2 and the gas is forced between the glass beads counter-current to the liquid to escape via the tube 14. The liquid collects in the housing 18 and may be run off through port 19 as desired.

Note the Figures below:

Fig 1

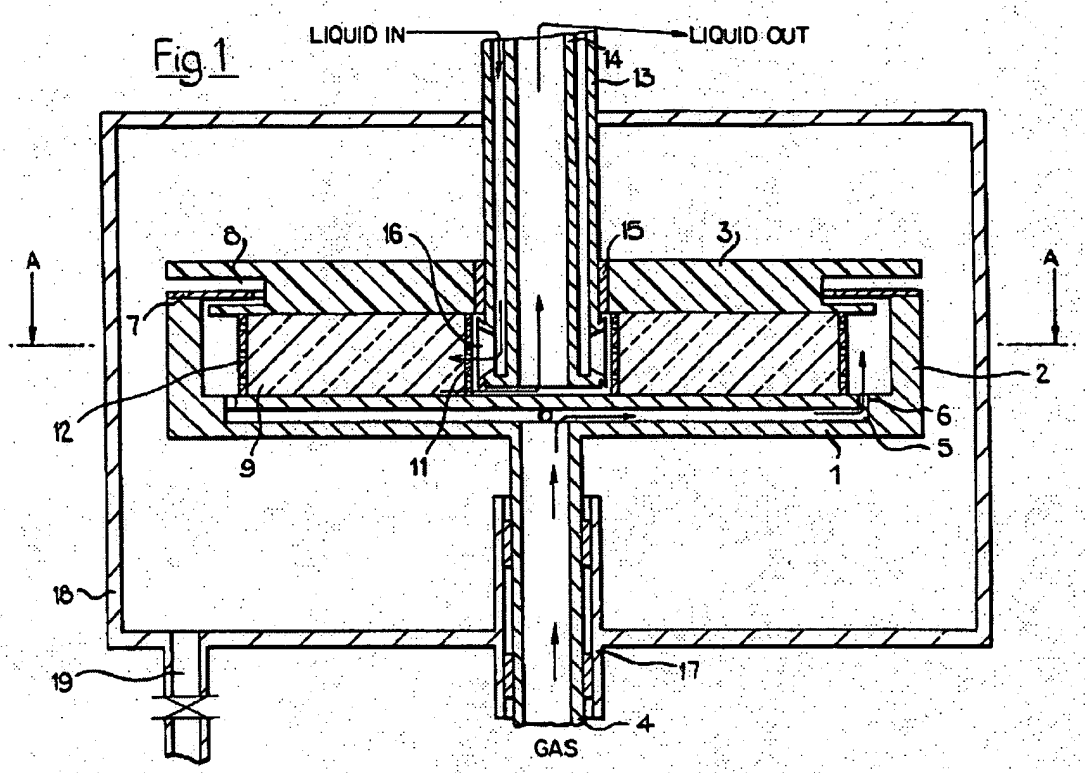
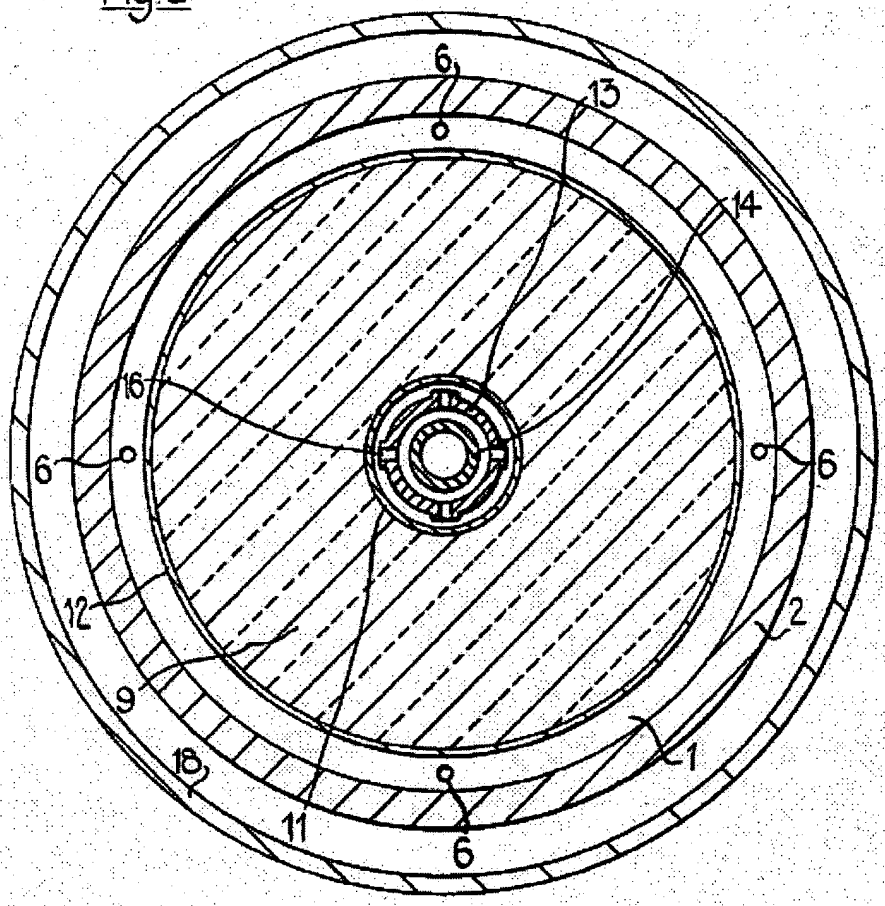


Fig. 2



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20. While the examiner might speculate as to what is meant by the language of claims 13 and 15, the uncertainty provides the examiner with no proper basis for making the comparison between that which is claimed and the prior art (MPEP 2173.06). Rejections under 35 U.S.C. 103 should not be based upon "considerable speculation as

to the meaning of terms employed and assumptions as to the scope of the claims." *In re Steele,* 305 F.2d 859, 134 USPQ 292 (CCPA 1962). When no reasonably definite meaning can be ascribed to certain terms in a claim, the subject matter does not become obvious, but rather the claim becomes indefinite. *In re Wilson*, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970). As it has been held that it is improper to rely on what are at best speculative assumptions as to the meaning of a claim and then base a rejection under 35 U.S.C. 103 thereon, no such rejections have been made concerning claims 21-34. *Ex parte Brummer*, 12 USPQ2d 1654. However, the lack of such rejections should not be construed as meaning that the claims as presently drawn would be patentable if corrected. Any response should carefully consider the prior art of record in accordance with 37 CFR 1.111.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles E. Cooley whose telephone number is (571) 272-1139. The examiner can normally be reached on Mon-Fri. All official facsimiles should be transmitted to the centralized fax receiving number 571-273-8300.

23. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charles E. Cooley
Primary Examiner
Art Unit 1723

14 April 2006